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Comments:

From the
SCS Chief

Improving the Information We Give to Farmers

Eight U.S. Department of Agriculture (USDA) agencies are combining the information they collect on crop yields, management, weather, and soil to improve the help they give to farmers.


Farmers often see clear differences in crop growth on different parts of the same field under the same management. Many times soil wetness, too little topsoil, a shallow rooting zone, or other soil problems cause the patches of poor growth. On severely eroded soils yields may be so low that farmers will lose money on every acre that they plant.

In the past, SCS crop yield estimates didn't fully reflect these differences. That's why an interagency committee, chaired by the Soil Conservation Service, is developing USDA's new Soil-Crop Yield Data Base.

It will include yield, soil, management, and weather information for the major crops in the United States by kind of soil. The data base will show how erosion affects productivity and the merits of different cropping systems for different kinds of soil.

USDA agencies will be able to send and retrieve soil and crop yield information through the data base at the Department's Washington (D.C.) Computer Center.

SCS and other USDA agencies will use the information to help farmers make conservation decisions important both to their livelihood and to the Nation that depends on them.



Cover: Cablegation on alfalfa. This automated furrow irrigation system on Jim Bernal's farm near Grand Junction, Colo., is one of the most advanced in Grand Valley. Only the individual risers at each furrow and the water control box are above ground—the rest of the system is underground. See the irrigation water management articles beginning on page 8. (Photo by Tim McCabe, visual information specialist, Public Information, SCS, Washington, D.C.)

John R. Block
Secretary of Agriculture

Peter C. Myers, Chief
Soil Conservation Service

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News Briefs

USDA Agencies Pool Soil and Crop Yield Information

U.S. Department of Agriculture agencies and their cooperators can soon begin using the new Soil-Crop Yield Data Base stored at the Department's Washington (D.C.) Computer Center.

The Soil Conservation Service is leading a USDA interagency committee in planning the collection and use of the information, which will include yield data for the major crops grown in the United States combined with specific information on cropland management, weather, and soil.

Other participating agencies are the Agricultural Research Service, Agricultural Stabilization and Conservation Service, Cooperative State Research Service, Economic Research Service, Extension Service, Federal Crop Insurance Corporation, and Statistical Reporting Service.

SCS will use the data to improve its yield estimates for various crops on given soils under defined management practices and to determine the soil properties that most influence crop yields. The agency will also use the data to more accurately define and identify fragile soils and areas which qualify for targeting of conservation assistance.

The new soil and crop yield data base should provide information SCS can use to document how no-till and other forms of conservation tillage, meadow in a cropping sequence, summer fallow, crop varieties, fertility, drainage, compaction, crop residue management, and irrigation affect crop yields on specific soils.

Some of the other agencies will be using the data base information to estimate the costs and returns of conservation tillage systems, test models of soil productivity, analyze the economics of conservation programs and policies, and

list the soils and crops across the Nation on which specific kinds of research or trials are being done.

The USDA Soil-Crop Yield Data Base responds to the call in the Soil and Water Resources Conservation Act of 1977 for an integrated natural resource data base. It will help SCS and others better understand how erosion, management practices, and weather affect crop yields.

The ultimate value of the data will be to enable USDA agencies to provide better cropland management assistance to farmers.

Donald E. McCormack,
national leader for soil technology, SCS,
Washington, D.C.

A New Tool for Meeting Conservation Needs

The Soil Conservation Service is using a new formula for deciding how much of its available conservation technical assistance (CTA) money should go to each State.

SCS first used the system in making fiscal year 1983 allowances and the system is running smoothly. The main objective is to put CTA funds where they can do the most good.

Each year States distribute CTA funds that they receive from national headquarters among their area and field offices. One way States could insure that the funds go to the areas of greatest need is by developing their own version of the allowance formula to reflect State and local resource conditions and needs.

This could most easily be done by States who will be receiving county resource data from the 1982 National Resources Inventory. States can receive help from members of the conservation planning and application staff in Washington, D.C.

Gerald W. Root,
assistant director, Conservation Planning and
Application Division, SCS, Washington, D.C.

Conservation Gains Through PIK Programs

Farmers who took part in the U.S. Department of Agriculture's 1983 payment-in-kind (PIK) programs reduced soil erosion by more than 20 percent on cropland taken out of production, according to Secretary of Agriculture John R. Block.

Releasing a preliminary report on conservation benefits of PIK and acreage reduction programs, Block said soil erosion on an estimated 79 million diverted acres was lowered from an average of 7.4 tons to 5.8 tons per acre per year.

"That adds up to 121 million tons of soil that stayed on the land," he said. "While the chief goal of the PIK programs was to bring down production, other goals included reducing erosion on idle acres, improving wildlife habitat, and conserving water."

The report, based on data from a sample of 4,300 farms in 227 counties, shows that about 35 percent of the diverted land provided suitable cover for wildlife. About 13 million acre-feet of water that would have been used to irrigate 8 million acres of cropland also was saved by the conservation use acreage programs.

A more detailed report expected later this year will show other major achievements in conservation, Block said.

Copies of the preliminary report are available from USDA's Agricultural Stabilization and Conservation Service, Room 4714-S, P.O. Box 2145, Washington, D.C. 20013, or by calling (202) 447-6221.

Conservation Tradition Makes a Picture-Perfect Farm

The owners of Panora Acres, Inc., the farm pictured on the first-day cover envelopes for the new soil and water conservation postage stamp, say they are proud to have the photo of their farm appear on the envelopes. The stamp commemorates the 50th anniversary of the soil and water conservation movement in the United States.

Norman and Paul Sellers own the Carroll County, Md., farm which has been in the family for over 100 years and has a tradition of conservation.

The Sellers' father, Edgar, signed up as a cooperator with the Carroll Soil Conservation District in 1945. That year he had Soil Conservation Service conservationists design contour strips for his row crops to keep the soil from washing downhill. In 1951, he bought an adjoining farm and put it in contour strips too.

Today, the Sellers still plant their crops in the pattern laid out years ago. "Farmers who've stopped contour stripcropping because it makes it difficult to use large equipment," said Paul Sellers, "might find it easier to get around the field the first year. But the next year, it's going to

be harder with the 3-foot-deep gullies that will have formed."

The Sellers own 200 acres and rent 300 adjacent acres. They have 300 acres in corn, 100 acres in small grain, and 100 acres in hay and pasture. They also run a dairy operation and feed cattle for beef.

Since taking over the farm operation in 1966, the brothers have started planting their row crops using no-till. Two years ago, they began planting alfalfa on hill-sides using no-till equipment rented from the conservation district. "This way," said Norman Sellers, "we don't have to plow and risk hard rains washing the topsoil away."

Although the crop and dairy operation is larger and more intense than in their father's day, the Sellers say they feel that their use of soil and water conservation has kept the land from showing stress. "No-till protects the land, conserves soil moisture, and gives better yields," said Norman.

The Sellers take soil tests annually to make sure they aren't overloading the soil with fertilizers that will wash off and pollute streams. They also make sure that when they spread animal waste, which is hauled to the fields daily, it is far enough from streams to avoid contaminating them.

According to Jack Sanders, SCS district conservationist in Carroll County, the Sellers' farm has long been a model of good conservation. Last year, the Carroll Soil Conservation District named the Sellers outstanding cooperators of the year.

To the Sellers, conservation is an investment in their family's future. Said Paul, "Our sons will be able to farm the same land and it will produce as much as, or more than, it did for us because of soil and water conservation."

Norman added, "I want to feel that I've contributed to operating this farm in a way that will enable our children to continue farming."

Katherine C. Gugulis,
public affairs specialist, SCS,
College Park, Md.

Winning Points With Conservation Tillage

Two Minnesota soil and water conservation districts (SWCD's) sponsored a conservation tillage contest one day last fall to keep farmers' interest in the soil-saving practice high.

The Benton and Sherburne SWCD's worked with the Soil Conservation Service, other U.S. Department of Agriculture agencies, University of Minnesota scientists, and local farmers in writing the rules and running the contest.

The 12 contestants, 11 using chisel plows and one an off-set disk, competed to gain the most of 1,000 possible points. Judges considered the amount of oat stubble residue left on the surface to protect the soil from erosion, the depth of tillage, surface roughness, and efficiency.

The judges awarded up to 200 points for efficiency according to a table based on the horsepower (hp) hours required to till an acre. The judges timed the contestants as they made two rounds on assigned plots and measured the area tilled.

Surface roughness and depth of tillage were each worth 200 points. Surface roughness was based on the distance between ridges and ridge height. Contest-



Panora Acres,
Carroll County, Md.

Photo by Tim McCabe,
visual information
specialist, Public
Information, SCS,
Washington, D.C.

ants who left the plots rough enough to trap snow but not so rough as to impede the next tillage operation received the most points. To get the maximum points for depth of tillage, contestants had to till at least 8 inches deep, enough to break through most plow plans.

The percent of the ground covered with crop residue was worth 400 points. Judges deducted points for too much residue as well as too little. To win all 400 points, a contestant had to leave 50 to 54 percent of the ground covered. To determine the percent, judges stretched a cable across the plots at three locations and counted the number of clips on the cable touching crop residue. The winner in this category received 370 points for leaving 47 percent of the ground covered.

The overall winner of the conservation tillage contest, Alvin Kloss of Rice, Minn., received 875 points out of 1,000 and left 40 percent of the ground covered with residue. He used a 130-hp tractor pulling an 11-foot chisel plow with a gang of disk blades on the front and 3-inch twisted points.

The top three contestants received plaques with a hand-carved chisel tool on each. The others received smaller plaques.

Kloss has been a cooperator with the Benton SWCD for close to 10 years and uses mulch tillage on his 320-acre farm where he runs a dairy and hog operation and grows corn, alfalfa, and small grains.

SCS Soil Conservation Technician Kevin Adelman in Benton County said that the contest sponsors have already begun planning the next conservation tillage contest to be held this September.

Adapted from an article in the January 1984 issue of *Successful Farming*.

New USDA Report Documents Returns for Different Tillage Practices

A recently published report by the U.S. Department of Agriculture's Economic Research Service (ERS) concludes that returns for different tillage practices show no clear-cut difference in the short run for most U.S. corn and soybean farmers.

Michael Hanthorn, an agricultural economist for ERS and coauthor of the report, *Returns to Corn and Soybean Tillage Practices*, says their analysis shows that although it may take several growing seasons to adjust to conservation tillage, most farmers can expect to maintain yields with lower operating costs.

The report is based on an analysis of 1980 data collected from sample cornfields in 10 North Central States and sample soybean fields in the Midwest, Midsouth, and Southeast.

Hanthorn cautions that the study is for only one crop year and the 1980 season was abnormally dry. Despite these factors, Hanthorn believes the report is a "strong statement, the first national study I've seen that looks at most of the short-run costs—including pesticides, fertilizer, and seed—that are affected by a change in tillage."

The report compares these costs and the cost of field preparation and mechanical cultivation for no-till, reduced tillage, and conventional tillage. It shows that decreases in costs of per-acre field preparation and cultivation more than offset increases in costs of pesticides, fertilizer, and seed for most conservation tillage farmers.

Neither corn nor soybean yields per acre varied significantly among the three tillage methods, except for soybeans in the Midwest. Midwest conventional-till soybean yields averaged 7 bushels per acre more than no-till soybean yields. These higher yields more than offset the higher production costs and resulted in an average per-acre return for conventional-till soybean farmers (\$155.54) that was significantly higher than the average return for no-till soybean farmers (\$112.48).

The nature of the analysis precluded considering other factors that influence the economics of conservation tillage and farmers' tillage preferences, such as differences in long-term yields, management costs, soil loss, and other environmental factors.

The study suggests that farmers are adopting conservation tillage to reduce energy and machinery costs and to save time during the critical planting season.

This report offers corn and soybean farmers an analysis of actual production data that may help them decide whether to use conservation tillage.

Returns to Corn and Soybean Tillage Practices is available for \$1.25 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (Stock No. 001-000-04398-6). There is a 25-percent discount for orders of more than 100 copies.

Donald L. Comis,
assistant editor, *Soil and Water Conservation News*, SCS, Washington, D.C.

Killing Weeds During No-Till Fallow

The cheapest way to kill weeds during no-till fallow has been under study at the Texas Agricultural Experiment Station in Bushland, Tex. Pigweed, barnyardgrass, witchgrass as well as volunteer wheat and other plants frequently escape soil-applied herbicides, Texas agronomists say. These weed seedlings can be killed with lower rates of herbicides in a low-volume spray application, studies show. This is cheaper and more effective than plowing, says Allen Wiese, professor of weed science at the Experiment Station. For example, pigweed under 1.5 inches can be killed with as little as 0.12 pound per acre of herbicide.

For more information, contact Allen Wiese, Texas Agricultural Experiment Station, Texas A&M University, P.O. Drawer 10, Bushland, Tex. 79012.

Best Management Practices Keep the Sediment Out of Rock Creek

The best way to get conservation on the land is through local people who care the most about the land. And the Snake River and Twin Falls Soil Conservation Districts, along with the Twin Falls County Agricultural Stabilization and Conservation Committee, have proved it through the Rock Creek Rural Clean Water Project.

The project, now in its third successful year of planning and implementation, is one of 21 such experimental projects in the Nation funded under the Rural Clean Water Program (RCWP).

Rock Creek, located in Twin Falls County in southern Idaho, flows through a major irrigation tract and the city of Twin Falls before entering the Snake River. Over the years, irrigation return water transported tons of topsoil and associated pollutants into the creek and the Snake River. In 1979, Rock Creek was listed by the Idaho Bureau of Water Quality as one of Idaho's most polluted streams.

The purpose of the project is to reduce the amount of sediment, animal waste, fertilizer, herbicides, and other pollutants

entering Rock Creek from about 45,000 acres of surrounding farmland. To accomplish this, long-term financial and technical assistance is being provided to farmers for installing and maintaining Best Management Practices (BMP's).

The project is funded at \$2.4 million. USDA's Soil Conservation Service provides technical assistance in developing water quality plans and coordinating water quality monitoring activities. USDA's Agricultural Stabilization and Conservation Service administers the program and provides financial assistance in implementing the plans.

To reduce nonpoint source pollution and to improve water quality, farmers, conservation districts, Extension Service, Agricultural Research Service, and SCS worked together to develop and select the BMP's. BMP's can be applied individually or in combinations and are keyed to cropping systems using furrow irrigation on highly erosive wind-deposited silt loam soils. They include conservation cropping and tillage systems, sediment basins, filter strips, mini-basins, I-slots for trapping sediment, buried waste water lines, concrete ditches, gated pipe, and tailwater recovery systems.

Conservation district supervisors also worked with technical assistance

agencies to identify critical areas within the project boundaries where agricultural activities most severely affected Rock Creek. Then they divided the project into 10 subbasins and ranked them according to treatment needs.

Farmer interest and participation in the project is high as a result of an intensive information and education effort. Methods used included tours, group meetings, and many hours of one-on-one contact by district supervisors. At present, 128 contracts have been signed for planning and implementation, and more than 450 BMP's installed and successfully maintained.

To evaluate the effectiveness of the project approach, the Rock Creek project was chosen for special funding to conduct a comprehensive monitoring program, which will be carried out through USDA agencies by the Idaho Department of Health and Welfare's Division of Environment.

The monitoring data obtained so far show a 60- to 80-percent reduction of sediment entering Rock Creek from the highest-ranked subbasin over the past 3 years.

Roy Jesser, local farmer and chairman of the Rock Creek RCWP Board, says, "We never realized just how much topsoil



At left, under a monitoring program for the Rock Creek Rural Clean Water Project, Susan Remseyer, water quality technician for the State's Division of Environment, measures the flow on Rock Creek. Near right, the Division's senior water quality analyst, Don Martin, checks a flow gage. Far right, I-slots are one of the Best Management Practices installed under the Rock Creek project to trap sediment.



was leaving our fields until the monitoring portion of the project began showing results. We knew we were contributing sediment to Rock Creek, but we usually felt the guy on the other side of the fence was the culprit."

USDA's Economic Research Service and the University of Idaho Department of Agricultural Economics are evaluating the social and economic effects of BMP's, and the University's Department of Agricultural Engineering and the Idaho Water and Energy Resources Research Institute are developing an erosion and sediment transport model for the irrigation tract.

The Rock Creek RCWP Project is proving that farmers, with the help of active conservation districts and cost-share funding, can solve their resource problems.

The technical knowledge gained through the project is reaching beyond the local level. Idaho now has a State agricultural water quality cost-share program patterned after RCWP.

Tony Bennett,
soil conservationist, SCS, Twin Falls, Idaho



Water Conservation Systems Increase Crop Yields

H. Dale Fuehring, an agronomist at New Mexico State University Agricultural Experiment Station's Plains Branch near Clovis, has experimented with several water conservation systems to determine which systems result in maximum returns for continuous grain production under arid and semi-arid conditions.

"If there is no way to hold all the available water for growing plants, runoff occurs and every inch lost costs in grain production," Fuehring said. "If water can be collected and concentrated, it appears that crop production could be feasible even in areas with only 6 inches average growing season rainfall."

Salted watersheds are proving to be an effective cost-efficient way to harvest water at the Clovis station. The 1982 milo crop in a salted shed area yielded 8,000 pounds per acre of growing bed, or 3,200 pounds per acre of total shed and bed area, despite receiving about 1 inch less than the normal 12 inches of growing season moisture.

Sodium ions from common salt applied on the shed area attract and disperse clay particles in the soil surface. The clay particles form an impervious layer which sheds rainwater. As an added bonus, salt keeps the shed area weed free.

Salted shed systems installed at the Plains Branch in 1980 are still good and should be good for several additional years, although a light application of salt may eventually be necessary, Fuehring said.

The sheds were placed across the field slope with dikes in the furrows to prevent runoff. Water is shed from 120 inches of salted area onto 80 inches of growing bed. Under drier climatic conditions, the shed would need to be wider in order to gather water from a greater area.

Sunflowers, sweet sorghum, and pinto beans are responding well to salted bed systems. Fuehring says cotton should do well in a salted shed system in areas where the growing season is long enough.

The researcher is also looking at small-scale water harvesting with a skip row technique. Under this system, rows are planted on top of beds with furrows between planted rows. The furrows direct water between rows, while the dikes catch runoff.

Skip row systems are set up so that one row out of three is blank or so that every other row is blank. This procedure allows plant roots to extend across an 80-inch area between adjacent rows.

Several methods of terracing are also used in conserving water runoff.

Terracing is effective in holding most rainfall, but it tends to be costly, Fuehring says.

According to the agronomist's studies, at 15 inches of rainfall a skip row system with one row skipped out of three results in the best milo yields, while at 12 inches of rainfall skipping every other row is best.

At 9 inches of rainfall, the salted shed areas with two-thirds of the area salted and the skip row system with 80-inch rows appear about equally effective; but since part of a salted system is not worked, farming costs are lower and net profit and return to investment is higher with the salted systems.

"The best system will be one that allows growers to produce cheaply and get maximum yields from the available water," Fuehring said.

He uses minimum tillage on his plots. Stalks and residue are pastured during the winter. In the spring, old furrows are cleaned out, ridges are rebuilt, and anhydrous ammonia is injected on either side of growing rows.

For more information, contact H. Dale Fuehring, New Mexico State University Agricultural Experiment Station, Plains Branch, Star Route Box 77, Clovis, N. Mex. 88101.

Irrigation Water Management

Automated Irrigation Surges Ahead in Texas

Surge-flow irrigation promises to do for furrow irrigation today what center-pivots did for sprinkler irrigation 20 years ago—automate it to save time, labor, water, and energy.

Coming at the same time as skyrocketing energy prices that threaten the future of irrigation on the Texas High Plains, surge is being used by Texans even though it is still in the research stage.

Graded-furrow irrigation is the predominant irrigation method used in the Texas High Plains. Graded furrows slope downward gradually so water applied at the higher end of the field flows to the lower end.

With regular graded-furrow irrigation, farmers may water 20 corn rows at one time with a steady flow for 12 or 24 hours. A surge irrigation set waters 40 rows, alternating the flow to water 20 rows for about an hour, then the other 20 rows, until the land gets the water needed.

The surging action caused by turning the water on and off smoothes and hardens the soil, decreasing its water intake rate and causing the furrow stream to advance up to twice as fast as with regular irrigation.

Steady-flow irrigators often can't apply a uniform depth of water because it may take from 12 to 18 hours for the water to reach the lower end of the field. To apply adequate moisture at the lower end of a field, they must overwater the upper end, where some of the water percolates down below the reach of plant roots. The water flows off the field for a few hours before the lower end is sufficiently wet, resulting in tailwater loss. And there is usually a spot about two-thirds down the field that doesn't get enough water.

Surge allows farmers to apply water much more uniformly, reducing deep percolation and tailwater losses and saving up to a quarter of the water used in steady-flow irrigations.

The water-conserving advantage of surge applies particularly to the irrigation

before planting, when farmers need a light but quick application and have rough furrows that interfere with water flow.

Later, when crops such as corn and grain sorghum reach their peak demand for water, the heavier application needed could increase tailwater runoff because the surging action forms a crust on soils that drastically lowers the water intake rate after the pre-irrigation and two more irrigations. Many farmers may have to switch from surge-flow to steady-flow after two irrigations, or sooner on less permeable soils.

Surge is best suited to moderately permeable soils, such as those found on about half of the furrow-irrigated land in the Texas High Plains. It is a low-priced alternative to center-pivot on certain soils but doesn't compete with center-pivot on very permeable soils.

Surge and center-pivot share the disadvantage of tempting farmers to grow more crops than they can adequately water, without considering the risks. During a dry spell, farmers might speed up surge cycles to reach all crops faster and end up with inadequately watered crops.

Researchers at Utah State University at Logan coined the term surge in a research paper published in 1979. Although farmers had been alternating irrigation between fields for a long time, the Utah

researchers were the first to automate it.

USDA's Agricultural Research Service (ARS) has provided about half of the funds for Utah State's surge-flow research. Allan Humpherys, an ARS agricultural engineer, developed one of several types of valves used for surge irrigation.

In 1982, Utah State initiated a regional surge research project, with State agricultural experiment stations and ARS labs in several Western States. The ARS Conservation and Production Research Lab at Bushland, Tex., also began studying surge in 1982 and is now working cooperatively with the Soil Conservation Service on surge studies and field trials.

The Bushland researchers are testing the possible limitations of surge, such as whether it will work with very long furrows and how it works on different soil types. They also plan to compare the water intake rates of various soils for surge and steady-flow irrigation.

The SCS Irrigation Water Management team in Texas has the task of learning enough about surge to be able to train other SCS employees. Jerry Walker, the SCS civil engineer on the team, warns that with surge it is critical for farmers to monitor the irrigation to see that water is going where it is needed for crop production.



Jerry Walker, an SCS civil engineer, checks surge equipment. The open box (left) is called a controller—it controls the valves which switch the water flow to go left half the time, right half the time. The pair of bulges in the pipeline, one under the controller and one near Walker, are the valves containing the rubber diaphragms designed by Agricultural Research Service Agricultural Engineer Allan Humpherys.

Walker sees surge as a step toward the automation of steady-flow irrigation, which could save even more water. Walker says farmers run water for 12- to 24-hour cycles primarily for convenience. This means that water sometimes runs 5 or 6 hours longer than is needed. If they didn't have to get up in the middle of the night to close valves, they could run water only as needed.

Utah State University engineers are developing a computerized furrow irrigation system that will combine surge with steady-flow and automatically control the size of the stream flow. Sensors will monitor water infiltration and alert the computer when water reaches the end of the rows.

The scarcity of energy and water in the High Plains makes such automation a very timely solution.

Donald L. Comis,
assistant editor, *Soil and Water Conservation News*, SCS, Washington, D.C.

Hard Rows Ease Irrigation Flow

Texas farmer Phil Johnson stumbled into a promising irrigation technique when he modified his equipment so it compacted only every other furrow. He had been using a traditional method of wheel-traffic compaction, planned to speed the flow of water, when he decided to add unpacked rows to give himself another option.

Johnson was growing corn on 60-inch-wide ridges, two rows to a ridge. As the corn plants grew, he gradually cultivated a soft furrow in the middle of each ridge bed. He had found a way to get deeper soil moisture when needed by watering just soft furrows and to avoid deep percolation losses the rest of the time by watering the hard, compacted rows.

A cooperative study of Johnson's technique by the U.S. Department of Agriculture's Agricultural Research Service (ARS) and Soil Conservation Service showed watering just the hard furrows reduced deep percolation losses by an estimated 75 percent on Olton clay-loam soil, which is a moderately permeable soil.

Fred Pringle, the SCS soil scientist on the Texas Irrigation Water Management team, became interested in Johnson's idea and discussed it with Jack Musick, an agricultural engineer at USDA's ARS Conservation and Production Research Lab at Bushland, Tex. ARS and SCS signed a cooperative agreement with each other and Johnson to test the idea, starting with the 1982 summer irrigations.

They chose 120 corn rows on one of Johnson's ridge-tilled fields, watering the hard and soft furrows for a third of the rows, just the soft furrows for another third, and just the hard furrows for the rest. The rows were slightly less than 1/4-mile long.

The first year's results show watering just the hard furrows gave the best field application efficiency, an average of 63.7 percent. By watering just every soft furrow, they had an efficiency that averaged 58.5 percent; and for watering both hard and soft furrows, they had 54.5 percent.

The hard-furrow irrigation efficiency could be raised to about 80 percent by lengthening the rows to reduce tailwater runoff, but the lower end of the field might not receive enough water and corn yields at that end could go down. Drought-tolerant crops such as grain sorghum would be less affected.

During the severe drought of 1983, Johnson watered just the hard furrows for the first three irrigations but found he didn't get enough water to fill the root zone for the third irrigation, so he switched to watering the soft rows for the fourth and fifth irrigations. He did his sixth irrigation by watering just the hard rows again. Now he believes it would have been more efficient to have watered the soft rows just for the fourth irrigation and the hard furrows for the last two.

Last year, Johnson, Musick, and Pringle compared surge and steady-flow irrigation on soft furrows only and found significant water savings with surge.

Donald L. Comis,
assistant editor, *Soil and Water Conservation News*, SCS, Washington, D.C.

Computer Controls Farm Irrigation

A home computer has taken over a Colorado farm, turning center-pivot sprinklers on and off depending on each field's needs and obeying commands from the rural electric cooperative. It also turns on different colored lights in an office window to tell farm workers if pumps are off.

For the past 2 years, USDA's Agricultural Research Service (ARS) has been testing this automatic system on a farm near Sterling, Colo. ARS uses an irrigation scheduling computer program adapted for use with the electric cooperative's interrupted service option. The electric cooperative offers a 14-percent discount for irrigators who are willing to have their pumps controlled during peak power usage.

For the ARS test, the electric cooperative sends radio signals to the farm computer instead of to individual pumps as it normally does, so the computer can select which pumps to turn off. The computer then signals radio-controlled switches on the pivots.

The computer makes choices based on data for each field and weather information from an onfarm weather station it monitors. The farmer can change the priorities any time by adding information to the computer.

The computer not only automates the scheduling but also makes the electric cooperative's option more attractive to farmers since they can choose which pumps to shut down.

Dr. Dale Heermann, one of the ARS agricultural engineers who wrote and adapted the program, says farm workers only have to check the fields once a day instead of four or five times. To find pumps that are turned off, they just have to look at the lights in the office window.

Donald L. Comis,
assistant editor, *Soil and Water Conservation News*, SCS, Washington, D.C.

Cablegation: A Plug for Irrigation

Scientists have been experimenting with everything from plastic salad bowls to wastebaskets to find the best cablegation plug. Cablegation, a way to automate furrow irrigation, relies on a plug pushed through a pipe by irrigation water.

For regular, gated-pipe furrow irrigation, farmers use an aboveground pipeline with holes at intervals to allow a steady flow of water to a set of furrows. When the furrows have enough water, farmers manually switch the flow to a new set of furrows.

The cablegation plug acts as a traveling dam, holding back the flow of water. The plug is attached by a nylon cable to a reel at one end of the pipeline and is released at a controlled speed by a 12-volt electric motor.

The pipeline is carefully sloped downward so water can't back too far up the line. Water only flows through those gates that are in the section of pipe filled with water, which changes as the plug moves slowly forward.

Water flows most forcefully through the gates nearest the plug and dwindles toward the higher end of the pipe until it reaches a point where it is too low to reach the gates. There is no need to turn valves or open, shut, and adjust gates—the combination of gravity and the traveling plug control the flow.

Farmers can control the plug speed to water the furrows only as long as they need, eliminating overirrigation and accompanying losses from tailwater runoff and deep percolation.

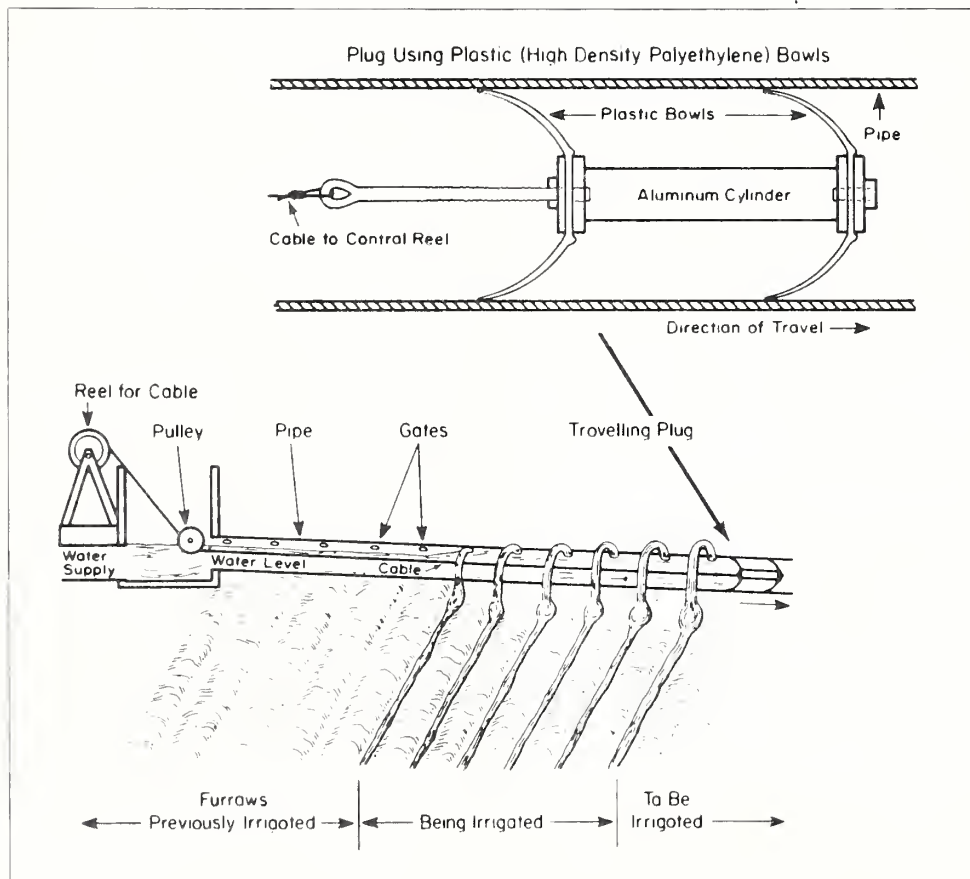
The reduction in deep percolation makes cablegation an important way to control salinity problems in irrigated

areas of the arid West, because deep percolation is the primary contributor of salt to Western rivers. The irrigation water picks up salt deposits as it trickles downward to the ground water.

This is why USDA Agricultural Stabilization and Conservation Service cost-share funds for the Colorado River Basin Salinity Control Program are supporting cablegation on several farms near Grand Junction, Colo., and on a farm in the Uintah Basin of Utah.

Jim Currier, a Soil Conservation Service soil conservationist at Grand Junction, says many farmers want to improve their irrigation, and cablegation is one way, depending on their situations.

Currier says, "Fields generally need to have fairly uniform soils and an adequate water supply to be suitable for cablegation, although recent advancements have shown systems can be adapted for a



At left, under cablegation, the water flow in a carefully graded pipe forces a plug down the pipe. A nylon cable—attached to the plug and a mechanically controlled reel—slows the plug to a chosen speed. Water flows most forcefully through the gates nearest the plug and dwindles toward the higher end of the pipe until it reaches a point where it is too low to reach the gates. Slits cut into the plug permit it to flex around any constriction in the pipe, such as gate openings, without impeding movement of the plug or altering gate settings. At right, W. Doral Kemper, director of the ARS Snake River Conservation Research Center, Kimberly, Idaho, who developed cablegation, holds a modified plug that makes it possible to use cablegation in an already existing gated pipe irrigation system.

wider range of conditions. Where those conditions apply, cablegation is a very efficient way to apply water to a field and save farmers time for more productive tasks than irrigating manually."

USDA's Agricultural Research Service (ARS) is working cooperatively with SCS and farmers to monitor cablegation on the farms in Colorado as well as farms in Utah, Wyoming, Idaho, Washington, Oregon, and California.

The director of the ARS Snake River Conservation Research Center in Kimberly, Idaho, W. Doral Kemper, developed cablegation. He and his colleagues have been improving it for the past 3 years, helping it move into commercial use.

Donald L. Comis,
assistant editor, *Soil and Water Conservation News*, SCS, Washington, D.C.



Ogallala Depletion Reduced 54 Percent in Texas

A recent survey by the High Plains Underground Water Conservation District shows the rate of depletion of the Ogallala Aquifer in Texas has dropped by 54 percent in the past 5 years, compared to the previous 5 years.

The High Plains water district looked at water-level records of 948 wells and found the average annual rate of decline for the past 5 years was only 0.9 foot per well, compared to 1.9 for the previous 5 years.

The manager of the High Plains water district, A. Wayne Wyatt, says, "It is for real when we say we have turned the corner as far as conservation of the water is concerned."

Wyatt is tired of what he considers negative, crisis-oriented coverage of the Ogallala Aquifer by the national media in the past 4 years. He knows how hard farmers are working to solve the problems and wants to get that word out.

Wyatt says the reason for the decline is that farmers are using water-saving practices, such as furrow dikes to trap rainfall and irrigating with rainfall runoff from the temporary lakes known as playas. They are replacing open ditches with pipeline to avoid losses from evaporation and seepage. They are choosing more drought-tolerant crops and crop varieties. Some are recovering part of their tailwater runoff.

Wyatt also credits help from the Soil Conservation Service, including mobile labs and soil moisture monitoring in cooperation with the High Plains water district.

Wyatt says most farmers in his area are using one or more water conservation techniques and many are planning to do more as their economic conditions permit. "Ultimately, this will even further reduce the rate of depletion of the aquifer," he said.

Donald L. Comis,
assistant editor, *Soil and Water Conservation News*, SCS, Washington, D.C.

High Plains Underground Water Conservation District Wins Award

The Irrigation Association chose the High Plains Underground Water Conservation District No. 1 in Lubbock, Tex., for its 1983 National Water and Energy Conservation Award.

The award recognizes the High Plains Water District's accomplishments in their 15-county, 8,000-square-mile area. The district, one of the oldest ground water conservation districts in the Nation, was created in 1951 to conserve the water of the Ogallala Aquifer.

The Irrigation Association cited the district for efforts such as setting up the first fleet of mobile irrigation-testing labs, evaluating pump efficiency, and monitoring soil moisture. The district supports irrigation research and cooperates with many organizations, including the Soil Conservation Service. For example, the district provides surge irrigation equipment for cooperative field trials with SCS.

The district worked with the Texas Department of Water Resources to publish detailed maps of the aquifer.

The Irrigation Association, a nonprofit international trade association which has members from throughout the irrigation industry and university and government research departments, began the award 3 years ago. Applications for the 1984 award are being accepted through September 1 at The Irrigation Association, 13975 Connecticut Avenue, Suite 205, Silver Spring, Md. 20906. For more information, call (301) 871-1200.

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New Publications

Advances in Drainage

by the American Society
of Agricultural Engineers

This 177-page paperback contains the 22 papers presented at the Fourth National Drainage Symposium held in December 1982. Leading experts in their fields discuss drainage design, construction techniques and materials, and drainage of heavy soils. The proceedings reflect the continuing changes and growth in practices, materials, and equipment that have occurred since the previous symposium. Authors use many graphs and charts to further illustrate their findings.

Copies of this book are available for \$14.50 from the American Society of Agricultural Engineers, Dept. 1602, 2950 Niles Road, St. Joseph, Mich. 49085.

Natural Systems for Development

Edited by
Richard A. Carpenter

This volume was developed in response to the pressing need to find creative and constructive ways to integrate natural systems information into economic development planning processes. Its initial purpose is to provide planners and policymakers with vital information on how economic development activities may affect resources and the environment.

As a self-teaching manual and reference—written in nontechnical language by experts from Asia, the Pacific, and the United States—the book gives decisionmakers awareness of a project's possible adverse consequences, skills to make needed

adaptations once the project is underway, and measures to respond to emergency situations.

Chapters cover such topics as air and water pollution, soil erosion and salinization, pest management, and wildlife conservation.

This publication is a unique resource guide that planners around the world will depend upon for practical guidance on how to proceed with economic growth—without causing damage to the natural systems being developed.

The book may be obtained for \$37.50 from Macmillan Publishing Co., Inc., 866 Third Ave., New York, N.Y. 10022.

Mechanics in Agriculture

by Lloyd J. Phipps

This 688-page, how-to-do-it book is a resourceful operating manual that covers almost every kind of agricultural mechanics activity, from shop work to soil and water management. Its contents are designed to meet the special needs of high school students, post-high school students, and adults preparing for occupations requiring knowledge and skill in agricultural mechanics. However, the book is a very useful tool for anyone engaged in any type of mechanical job in modern agriculture.

Emphasis has been placed on an analysis of actual mechanical jobs. The author explains, in simple terminology, the skills, problem areas, and do's and don'ts involved in performing various mechanical projects in the shop and in the field.

In addition, numerous pictures and diagrams are used to illustrate nearly every point the author makes. One of the more outstanding features of this practical guide involves the fact that the chapters are grouped into the six major areas of content in agricultural mechanics; and because the metric system

of measurement is now being used in these major areas, a chapter on the metric system has been included.

This book is available for \$22.50 from Interstate Printers and Publishers, Inc., P.O. Box 594, Danville, Ill. 61832.

Forage Research in Texas

by the Texas Agricultural
Experiment Station

The information compiled in this 188-page document is the result of research by the Forage Research Work Group of Texas. The report includes results and progress from those investigations by crop and animal scientists at the Main Experiment Station and regional centers in Texas. The contents address nearly all aspects of forage—including animal utilization, growth and productivity of warm and cool season grasses, breeding and adaptation aspects of legumes, and stand establishment and fertility.

The intended audience includes researchers and extension personnel and others interested in forage and grassland productivity.

This publication is available for \$2 from the Department of Agriculture Communications, Reed McDonald Building, Room 101, Texas A&M University, College Station, Tex. 77843.

Handbook of Weed and Insect Control Chemicals for Forest Resource Managers

by Michael Newton
and Fred B. Knight

This handbook is a useful guide for forest pest managers who want to find out more about important aspects of weed and insect control chemicals and pest management. It is specifically directed toward the proper use of

insecticides and herbicides and also addresses alternative methods of pest control.

The manual is basically divided into two sections: forest vegetation management and forest insect management. In both sections the authors clearly outline, in easy to understand language, the damaging effect that weeds and insects have on forests and how these forest pests can be handled with proper pesticide treatment. In regard to pesticide treatment, the guide examines the biological properties and uses of different pesticides and also lists various pesticide application methods.

Chapter five of the manual provides information on risks and care in handling pesticides. In addition, there is a section pertaining to the management of poisoning cases and a helpful glossary of terms. Although the handbook is designed for forest managers, it may be used by any individual who must become familiar with the chemical control of insects and weeds.

Copies of this handbook are available for \$17.95 (plus \$2 for shipping and handling) from Timber Press, P.O. Box 1632, Beaverton, Oreg. 97075.

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